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High-efficiency control of spin-wave propagation in ultra-thin yttrium iron garnet by the spin-orbit torque

Evelt M., Demidov V., Bessonov V., Demokritov S., Prieto J., Muñoz M., Ben Youssef J., Naletov V., De Loubens G., Klein O., Collet M., Garcia-Hernandez K., Bortolotti P., Cros V., Anane A.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

© 2016 Author(s).We study experimentally with submicrometer spatial resolution the propagation of spin waves in microscopic waveguides based on the nanometer-thick yttrium iron garnet and Pt layers. We demonstrate that by using the spin-orbit torque, the propagation length of the spin waves in such systems can be increased by nearly a factor of 10, which corresponds to the increase in the spin-wave intensity at the output of a 10 μm long transmission line by three orders of magnitude. We also show that, in the regime, where the magnetic damping is completely compensated by the spin-orbit torque, the spin-wave amplification is suppressed by the nonlinear scattering of the coherent spin waves from current-induced excitations.

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